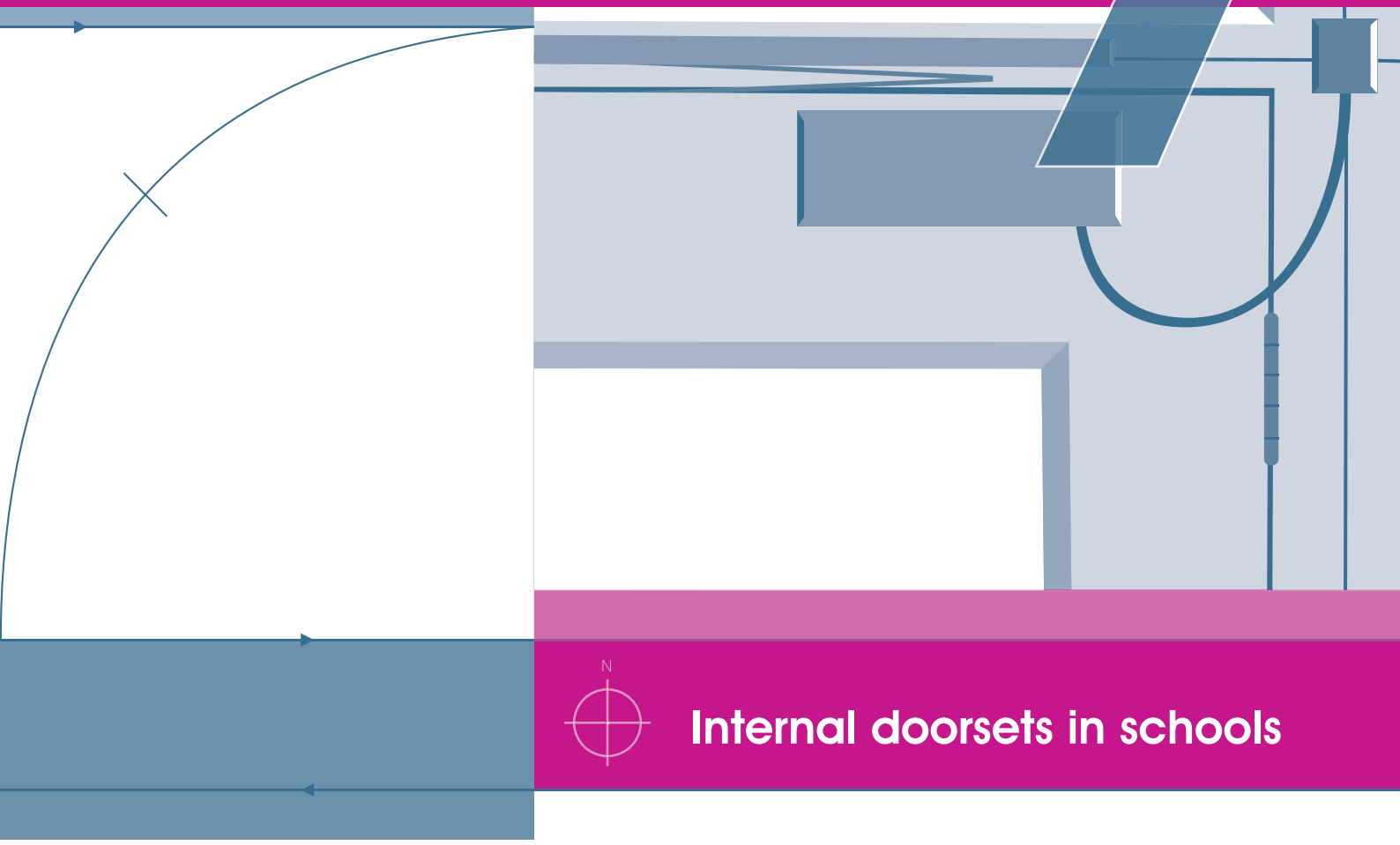
Standard specifications, layouts and dimensions

SEVEN



Internal doorsets in schools

department for
children, schools and families

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Beech Williamson, **Partnerships for Schools**

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Contents

Introduction

This guidance is one of a series of Standard Specifications, Layouts and Dimensions (SSLD) notes produced to inform the Building Schools for the Future (BSF) programme.

Who is this guidance for?

- Teachers and governors acting as clients for school capital projects.
- Local authority officers responsible for procuring school capital projects.
- Diocesan building officers.
- Local authority and private sector school designers and specifiers.
- Manufacturers and suppliers.
- Contractors.

How the guidance should be used

This guidance sets out the standards of performance for internal doorsets in the Building Schools for the Future (BSF) programme and shows through some examples how they might be delivered. It is one of a number of publications on various building elements within the SSLD series. The aim is to disseminate best practice and avoid 'reinventing the wheel' every time a school building is designed, so that consistently high quality environments can be delivered, offering best whole-life value for money.

School building clients, their professional advisers, contractors and their supply chains should use this guidance to inform their decisions on internal doorsets and specification standards at the early stages of a project's development – whether new build, extension or refurbishment – at RIBA Stages A-F.

To help encourage the take up of these performance specifications, this guidance will become the standard in BSF programme documentation and the Government will expect it to be adopted in the majority of situations where it is reasonable and appropriate to do so.

While we would expect projects to comply with the standards, other solutions – possibly based on new products or technologies, or reflecting local factors – may equally comply with the performance specification and could be used. We do not want to stifle innovation by being too prescriptive.

It will be for users to exercise their own skill and expertise in deciding whether a standard or example shown in this document is reasonable and appropriate for their own circumstances. This guidance does not affect obligations and liabilities under the law relating to construction and building.

Though principally aimed at secondary school building projects delivered through the BSF programme, the specifications and examples may also apply to other educational buildings.

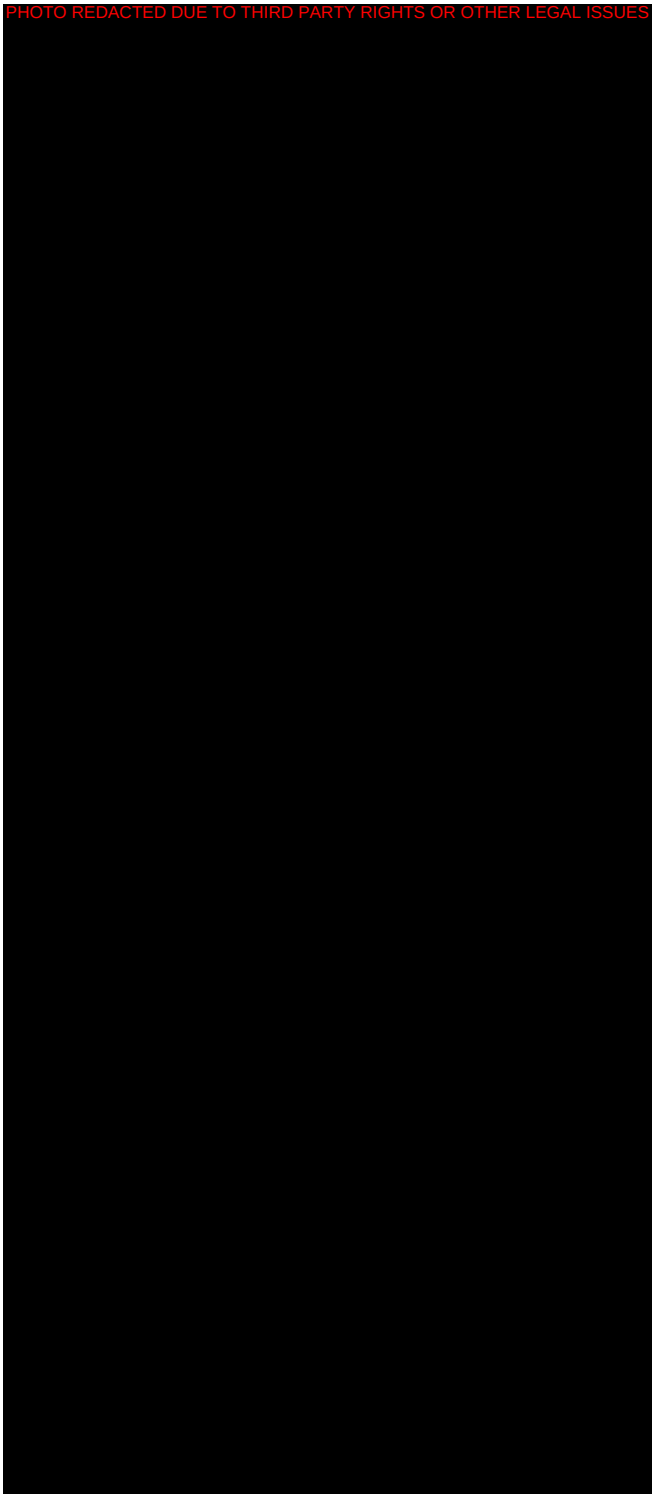
We will keep this guidance under review and update it as necessary to reflect the development of new products, processes and regulations. There is a web-based version at www.teachernet.gov.uk/schoolbuildings

Background to Standard Specifications, Layouts and Dimensions (SSLD)

The BSF programme offers a unique opportunity over the next 10-15 years to transform our secondary schools, providing innovative learning environments that will inspire pupils to achieve more. High quality, modern school buildings will help to raise standards and play a crucial part in the Government's programme of educational reform.

With the huge increases in funding associated with this programme, there is considerable scope for using standardised specifications, layouts and dimensions to speed up design and construction, reduce whole-life costs and deliver consistently high quality and better value school buildings. Standardisation will support the use of more off-site fabrication and modern methods of construction, which should help to improve health and safety performance, reduce waste and deliver more sustainable solutions. For the supply industry, being involved in standardisation will help to demonstrate market leadership – and help firms reduce risk and increase sales, profitability, and market size.

The examples in this document and the others in the SSLD series have been developed based on extensive consultation under the auspices of the SSLD Forum. Set up by the Department for Children Schools and Families (DCSF), this forum represents key stakeholders in the building design, research, contracting, and supply industry communities, as well as local authority construction client bodies.



Aims and scope of this guidance

This document provides standard performance specifications and some examples to help with the choice of internal doorsets in BSF secondary schools.

Specifically it:

- sets out minimum standards of performance and quality expected by the DCSF;
- provides design guidance for project designers formulating technical specifications;
- standardises internal doorset types so that efficiencies and economies of scale can be generated within the supply chain; and
- makes it easier for caretakers and facilities managers to maintain, repair and replace components correctly.

It is structured as follows:

Section 2

The generic performance characteristics of internal doorsets and their associated hardware in secondary schools. This section also sets out the specific whole-life cost information for the example solutions in Section 3.

Section 3

Performance specifications for internal doorsets and their associated hardware, in different locations within a building, together with some design examples that meet the performance requirements.

Section 4

References to relevant European, British Standards, DCSF and other design guidance.

This guide has been produced to inform rather than replace detailed project specifications. Descriptions are given in generic terms and are not intended to promote the products of specific manufacturers. Contractors and specifiers should consult with relevant manufacturers to establish which products are appropriate and compliant.

2

Key performance requirements

This section sets out the minimum generic performance and design standards DCSF would expect to be adopted for internal doorsets in BSF schools wherever it is reasonable and appropriate. Section 3 defines the specific internal doorset requirements for each location and suggests some examples that meet those requirements.

The primary functions of internal doorsets are to control movement between separate internal spaces within a school building and to maintain the different environmental conditions required within the various internal spaces.

Design requirements

Configuration

Doorsets should be specified wherever possible, rather than specifying separate components such as leaves, frames and architraves. This is because the latter is rarely supported by appropriate evidence of the combined door assembly's conformity with the appropriate performance requirements.

Specifying doorsets also has other advantages:

- Doorsets can be installed much later in the build programme, especially if they are of a cassette design that slots into a pre-formed aperture. This reduces the opportunity for damage to occur to the door between its installation and the building being completed and handed over.
- Doorsets require far less assembly of components on site. Where possible, such assembly should be restricted to fixing the architrave and any projecting hardware to the leaf, which may otherwise have been damaged in transit if pre-fitted to the door. This can:

- reduce the time needed to assemble and install doors once supplied to site; and
- reduce opportunities for components to be paired with the wrong doors and the resulting time required to rework or replace incorrectly assembled doorsets and associated waste.

The economies of scale achieved through standardisation of doorsets used should, in turn, mean that the replacement of complete doorsets is more economical, making it possible to avoid repair and replacement of individual components or elements of the doorset. This should lead to greater certainty that the doorsets continue to offer the full range of performance characteristics that those doorsets are required to provide.

If doorsets are to be installed into brick or blockwork walls, specifying cassette style doorsets can offer further advantages. These incorporate outer sub-frames that act as templates to aid the construction of the openings into which the doorsets are then fitted. The doorset is then installed directly into that sub-frame, offering the following advantages:

- The sub-frames ensure openings are sized to suit the doorsets to be fitted. This in turn helps ensure that the doorsets provide the required acoustic and other properties that might otherwise be affected if the size of the gaps between the doorset and supporting structure are not within acceptable tolerances.
- The sub-frames permit cassette style doorsets to be simply slotted into place once delivered. This can reduce installation times and allows the doorsets to be relocated to other openings more easily if the layout of the school changes within the doorsets' planned lifetime.
- The doorset is less likely to become damaged during construction and fit out of school, as doorsets can be installed much later in the build programme.
- Cassette doorsets can be easier to replace than door assemblies or standard doorsets.

Co-ordinated doorset dimensions

The following factors should apply:

- Use doorsets of standard sizes wherever possible, as this maximises opportunities for savings through economies of scale.
- Where the use of larger doorsets is unavoidable, specify those doorsets that incorporate:
  - multiple leafs of sizes consistent with those on other doorsets within the school; and
  - frames of cross-sections consistent with those on other doorsets within the school.

Height

Wherever possible, doorsets should be designed to fit structural openings of heights measuring 2100mm from the finished floor level and incorporate leaves 2040mm high.

Width

Doorsets must be sufficiently wide to permit:

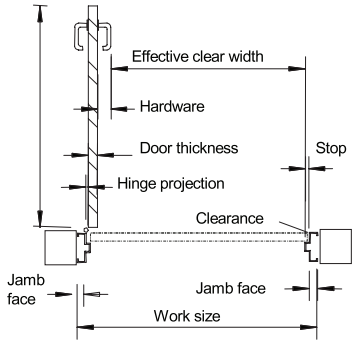
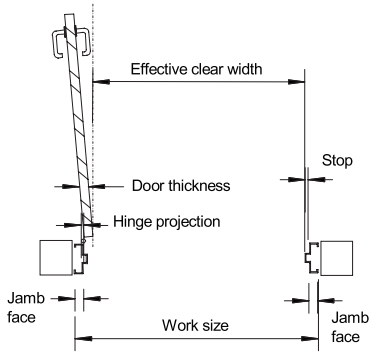
- movement of people, including those with disabilities, between adjacent spaces in accordance with the requirements of Approved Document M;
- people to escape safely in an emergency, in accordance with the requirements of Approved Document B; and
- the transfer of equipment and materials from one space to another.

Wherever possible, single leaf doorsets should be specified.

If single leaf doorsets are to be located either straight on from the direction of approach, without a turn or oblique approach, or at right angles to an accessible route at least 1500mm wide, the doorset should be designed to fit structural openings of widths measuring 1000mm and incorporate leaves 926mm wide.

In order to achieve the 800mm minimum clear opening width specified for such doorsets in Approved Document M, the impact of the leaf thickness and hardware projection need to be taken into account when specifying the doorset, its associated hardware and the surrounding layout, as the door leaf may need to open beyond 90 degrees, as illustrated in Figure 1.

Figure 1 Effect of door leaf opening angle on effective clear opening

Orientation of leaf when open	Example doorset dimensions (mm)		
(i) Leaf opened to 90 degrees 	**Leaf width**		926
	–	**Leaf thickness**	44
	–	**Stops (total of both)**	26
	+	**Clearance (total of both sides)**	4
	–	**Hinge projection**	15
	–	**Hardware projection**	70
	=	**Clear opening**	775
(ii) Leaf opened beyond 90 degrees 	**Leaf width**		926
	–	**Leaf thickness**	44
	–	**Stops (total of both)**	26
	+	**Clearance (total of both sides)**	4
	–	**Hinge projection**	15
	–	**Hardware projection**	N/A
	=	**Clear opening**	845

If single leaf doorsets are located at right angles to accessible routes less than 1500mm wide, wider doorsets that provide a clear opening of at least 825mm should be specified. While this can be achieved using doorsets with 926mm wide leaves, it is almost certain that the leaves will need to open beyond 90 degrees in order to achieve the 825mm clear opening specified in Approved Document M.

Where single leaf doorsets do not provide suitable access or egress, particularly in relation to the requirements of Approved Document B, consider:

- specifying double leaf doorsets formed from two 926mm wide leaves with plain meeting stiles;
- specifying leaf and a half doorsets formed from at least one 926mm wide leaf and both leaves having plain meeting stiles except where the doorset is across corridors or other circulation routes; and
- providing additional alternative routes because this not only helps minimise the size and mass of each doorset; doing so also:
  - helps ensure escape is possible if one route were to become blocked; and
  - may provide greater flexibility in terms of the future use of the space to which those doorsets lead.

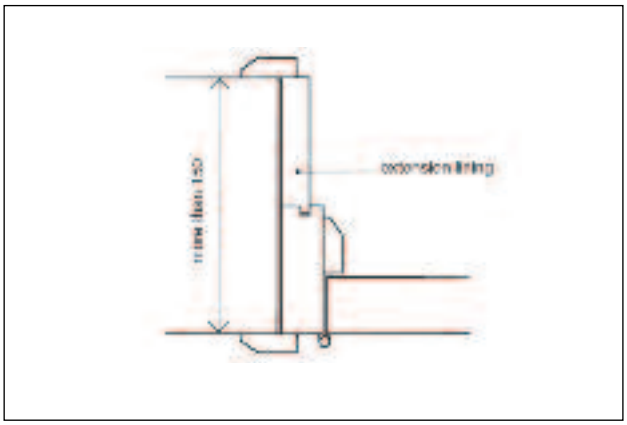
Frame depth

The depth of door frames should suit the thickness and construction of the wall[1] in which the doorset is to be fitted and should accommodate variances in wall thickness of ± 5mm.

Steel doorsets are typically available with a range of one-piece frames of sizes and designs to suit different wall thicknesses and configurations.

It is usually possible to fit timber doorsets with one-piece frames into walls up to 150mm thick. Beyond that thickness, extension linings may be required as illustrated in Figure 2.

Figure 2 Use of extension lining on thicker partitions



Tolerances

The following factors apply:

- Doorsets should be capable of accommodating deviations in the size of structural openings. Doorsets should therefore be built to suit the size of the openings, with a tolerance of – 10mm / + 0mm[2] on the width and height of the opening and ± 5mm on wall thickness.

1 Refer to DCSF publication – 'Standard Specifications, Layouts and Dimensions. 1: Partitions in schools'.

2 Based on maximum gap recommended within BB93.

- Use doorsets with common frame dimensions because this:
  - helps to maximise economies of scale associated with the doorset production;
  - simplifies building works, enabling all openings to be built to the same size; and
  - reduces opportunities for confusion and errors.

Thresholds

Avoid doorsets that incorporate thresholds wherever possible as thresholds cut into the screed and can lead to cracking of the screed and will leave a groove in the screed if the door is moved.

Thresholds may also cause trip hazards and inhibit free movement of trolleys (used to transport ICT equipment, laboratory materials, etc.) and floor cleaning equipment.

Therefore, any thresholds that are fitted should:

- be set flush with the floor screed and covered by the floor finish;
- comply with the requirements contained within BS 8300: 2001.

Vision panels

Vision panels should:

- be fitted to all door leaves wider than 450mm, except those leaves on doorsets leading into the following spaces:
  - changing rooms;
  - medical inspection rooms/'sick bays';
  - plant rooms;
  - service ducts; and
  - store cupboards;
- be located towards the leading edge of the door, remembering to allow suitable space between the vision panel(s) and the leading edge of the leaf for:
  - door protection plates;
  - accommodating lock cases within the leaf; and
  - operating handles without catching hands on any beading around the vision panel;

Figure 3 Doors with single vision panels

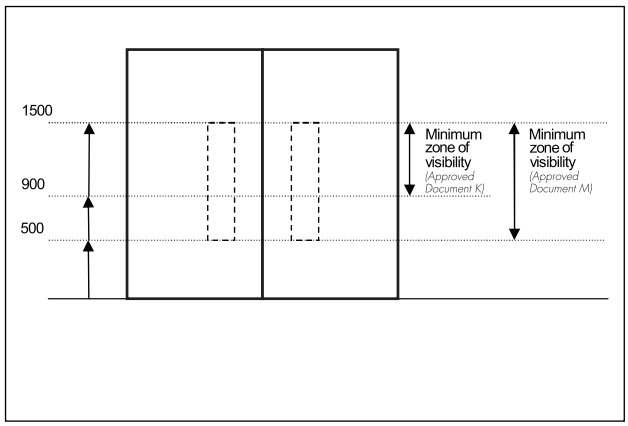
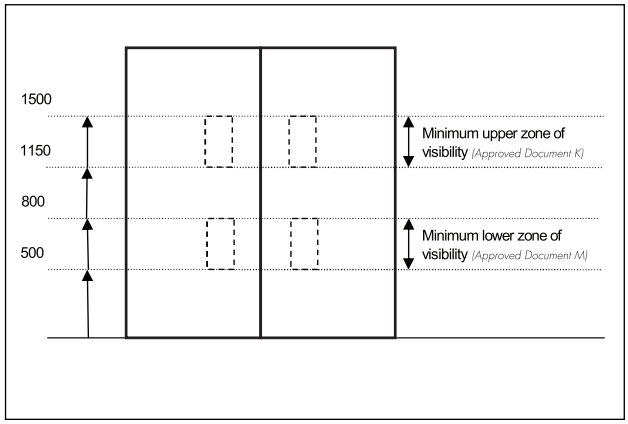


Figure 4 Doors with two vision panels



- provide effective zones of visibility. Alternative layouts that may be considered include:
  - a single vision panel that, at minimum, covers a vertical zone between 500mm and 1500mm from the floor, as shown in Figure 3; and
  - two vision panels, the lower of which at least covers a vertical zone between 500mm and 800mm from the floor and the upper of which at least covers a vertical zone between 1150mm and 1500mm from the floor, as shown in Figure 4;
- incorporate glazing that meets the requirements of Class C to BS 6206: 1981 if it is up to 900mm wide; and
- be covered by the evidence of conformity provided for the doorset in relation to the performance requirements contained in this standard, such as those relating to fire, acoustic and security performance.

If a degree of privacy is desirable, for example, on doorsets to offices or toilet blocks, either avoid incorporating vision panels or consider fitting privacy glass.

Hardware

General

Flush fitting hardware should be fitted to the doorset prior to delivery to ensure it fits and the doorset functions correctly. Projecting items, such as handles and surface-mounted door closers, should be packaged separately for delivery in order to avoid damage.

Any hardware that is supplied separately should be clearly marked to show which doorset it is paired with, as this will help to ensure the hardware is fitted to the correct doorset.

The hardware selected must provide functionality and performance appropriate to that doorset's intended use and must not undermine the performance of the doorsets to which they are fitted. Therefore, always ensure:

- the hardware is independently tested and certified to confirm it meets the relevant hardware classification requirements defined in the hardware specifications defined in Tables 7 to 14; and
- the use of hardware on the doorset is covered by the scope of the evidence confirming the doorsets' compliance with all the performance requirements identified in Section 3.

Co-ordinated designs and dimensions

Specifying the same hardware on as many doorsets as possible can help to achieve financial savings through economies of scale.

Specifying locking hardware from modular ranges with coordinated dimensions enables the hardware to be changed to suit the doorset's desired functionality if the layout of the school changes, or if there are changes to the way in which individual spaces within the school are used. It also generally makes it easier for fire and other performance assessments to be completed if the existing evidence does not cover the specific models selected.

The locks selected should also suit the fitting of cylinders that can be operated within a common master key system.

Access control

Doorsets should incorporate hardware that permits appropriate control of access through the doorset and, where appropriate, the record of any operations. This is particularly relevant to external entrance doorsets and internal doorsets within school that are likely to be opened to the general public.

Access control systems complying with BS EN 50133-1: 1997 can provide appropriate controls and avoid the need to replace complete key suites if a master key is lost, since the system can simply be reprogrammed to prevent the lost key being used. Such systems can offer flexible management of access according to how the school is to be used. For example, many systems allow access tokens (e.g. swipe cards) to be set in such a way as to allow only the holder access to particular areas at particular times, for example, access to the main entrance, relevant corridors and the appropriate teaching space(s) when the card holder is due to attend evening classes.

Ensuring the card or token incorporates a photo of the holder can help staff to ensure only the correct people are using the cards, thereby deterring misuse by criminals.

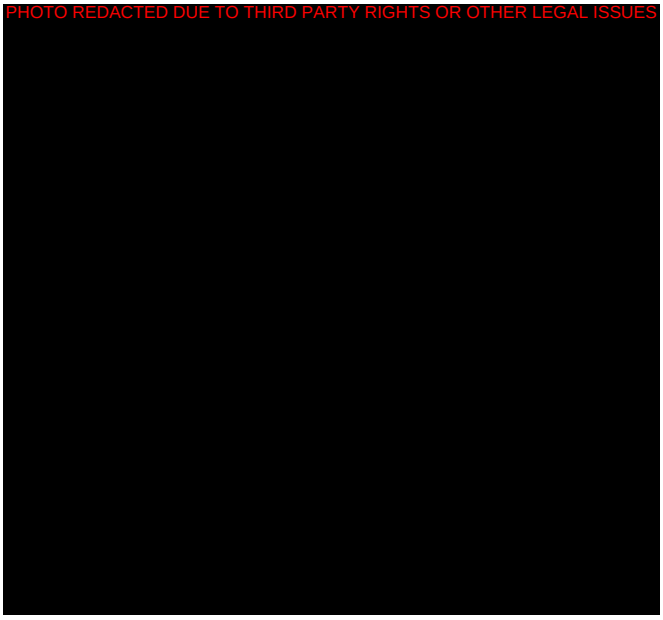
Although access control systems are generally hard-wired, internet protocols (IP) and other technologies are now enabling the use of wireless access control devices.

These can greatly reduce the cost of installing, repairing and replacing systems and their components or adding to the system at a later date.

As an alternative to installing hard-wired access control systems when upgrading existing schools, consideration should be given to fitting electronic lock cylinders in place of mechanical cylinders. This is because the costs of upgrading the mechanical cylinder locks to achieve the wider access control functionality possible with electronic locks can be much less than the cost of replacing the complete locksets or having wiring installed for more complicated access control systems. Electronic cylinders can also provide greater resistance to certain types of criminal attack.

Irrespective of the type of access control system and devices specified, it is important to ensure that any access control devices:

- do not undermine the performance provided by the doorsets on which they are fitted;
- do not inhibit escape in the case of a fire or other emergency;
- comply with relevant directives for electronic devices;
- can be operated by disabled users;
- offer appropriate durability;
- offer the range of functionality required; and
- can be easily repaired or replaced.



Materials and finishes

It is important to ensure that any materials and finishes specified:

- do not prevent the doorset providing the performance defined in Section 3;
- are widely available and are likely to remain available over the design life of the doorset so that matching replacement materials/parts can be sourced;
- are economically viable to use;
- are, wherever possible, available from sustainable sources;
- can be recycled at the end of the product's life; and
- are not hazardous and are not on the lists of banned materials available from the European Commission's Enterprise and Industry website (http://ec.europa.eu/enterprise) or the Health and Safety Executive (www.hse.gov.uk) websites.

Any timber used must be procured in accordance with the Government's Timber Procurement Policy. Further details are available from the following website: www.proforest.net/cpet/uk-government-timber-procurement-policy

Lippings

Door edges can be damaged during use, especially in high traffic areas or when there is regular movement of equipment and materials, for example in kitchens, workshops and laboratories.

Using electromagnetic hold-open devices (linked to an automatic fire detection and alarm system) can reduce the opportunities for damage, especially if the doorsets open sufficiently to permit free movement of people and materials through the opening.

Although they can be removed, it is important to consider their resistance to removal before specifying plastic lippings.

Table 1 Alternative door leaf edge protection

Type	Benefits	Weaknesses
Curved post formed edges	• Can reduce the chance of the laminate being damaged during the doorset's lifetime	• Can be more difficult and expensive to repair if they are damaged
Hardwood lippings	• Generally easier to repair than curved post formed edges • Can provide visual contrast down the edge of the door	• More prone to damage than curved post formed edges
Plastic lippings	• Can resist scoring	• Prone to removal

Surface finishes

The surface finishes should be suitably robust and perform their necessary protective and decorative functions. The following factors apply:

- The surface finish should have a resistance to marking of at least class 3 when tested to methods 2 to 6 in BS 3962-6: 1980 and should be capable of withstanding cleaning with hot water containing mild non-abrasive detergents and disinfectants as part of a regular cleaning programmes.
- The finishes should be covered by the evidence of the doorset's compliance with the performance requirements defined in Section 3.
- The finish should not create any reflections likely to disturb pupils or affect visually impaired people's ability to use the doorset.

Colour

It is important to ensure visually impaired users can negotiate doorsets safely by avoiding visual clutter and using colour and tonal contrast between surfaces (for example, frame, leaf and door handles).

Elements should therefore contrast visually with one another by the minimum differences in light reflectance value (LRV) specified in BS 8300: 2001. These are summarised in Table 2.

The following should be considered when specifying the colour of doorsets and adjacent walls, floors and ceilings:

- Colour code doorsets, frames, handles, walls and/or wall-floor junctions, as appropriate, to identify each class base or area of different activity.
- Avoid excessive use of bright colours or patterns because excessive use can result in over-stimulation or visual confusion. Remember, teachers and pupils will add colour to environment during activities undertaken and in their display of work.
- Light colours assist with good quality light reflectance; while dark colours reflect less light and may contribute to glare.
- Bright colours in large expanses and strong patterns can be over stimulating, confusing or distracting, whereas passive cool colours such as blue-green, light green and beige are thought to aid concentration.

Table 2 Minimum differences in light reflectance values (LRVs)

Elements	Minimum difference in LRV
Door leaf and operating hardware (e.g. handles)	20[3] (30 preferred)
Face and edge of door leafs that are not self closing or are held open	30
Door frame and surrounding wall, for example, by using an architrave that has the same LRV as the doorset but a different LRV from the surrounding wall	30

3 Based on results of research contained within the report 'The examination of the effects of differences between door faces and hardware in terms of light reflectance values (LRVs) and gloss levels' published by Research Group for Inclusive Environments in 2005.

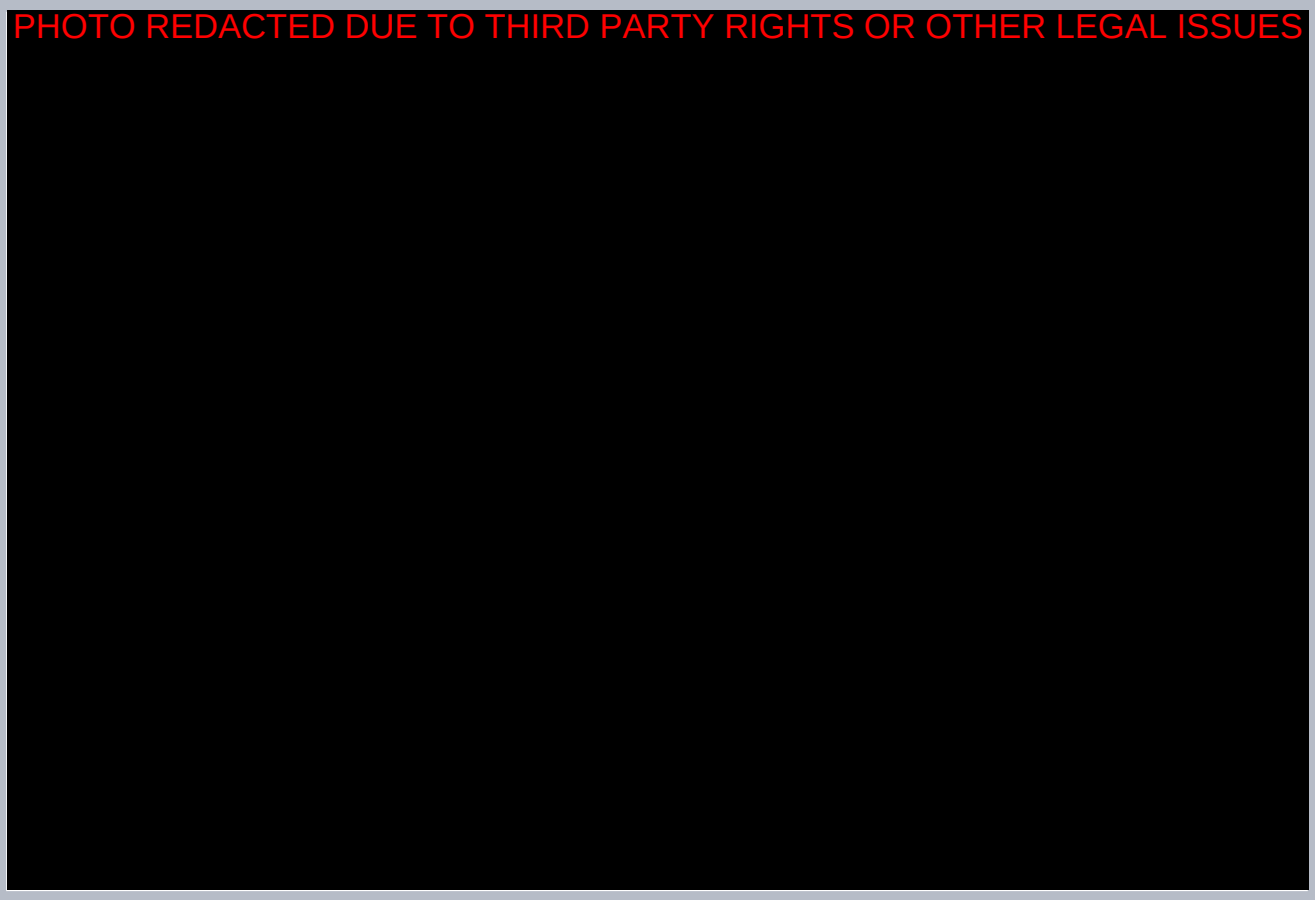
- Pastels and softer, subtle, subdued tones can be uplifting, soothing or calming for pupils who need a low stimulus or non-distraction environment, enabling teachers to introduce stimuli to suit pupils' needs.
- Contrasting tones of colour can be used to assist recognition, and way-finding, and for differentiation of wall and floor surfaces, doorsets, handles, frames, etc.
- Changes in the tactile qualities of surfaces can also assist with way-finding.
- High gloss finishes can cause reflections, which can affect the ease with which some visually impaired people use the doorset.

Hygiene

A doorset and its associated hardware should not contain materials which by direct contact or otherwise can be detrimental to the health and safety of the user.

Doorsets and their associated hardware should be designed and constructed so as to avoid undesirable accumulations of dirt, possible attack by micro-organisms, fungi or insects, or possible infestation by insects. This is particularly relevant for doorsets and hardware that will be used in areas where food is prepared or consumed, medical rooms and other areas where hygiene is particularly important.

All doorsets and associated hardware should be capable of withstanding wet cleaning of exposed faces using mild detergents or disinfectants, without deterioration or discoloration of surfaces or performance.



Acoustic performance

Good acoustic performance within schools is essential for learning; it facilitates clear communication of speech between teacher and student, and between students, and improves study activities.

Guidance on the minimum acoustic reduction values for doorsets is provided in Section 3 of this publication. The values specified are based on those specified in Building Bulletin 93.

The doorsets must have good perimeter sealing in order to provide the desired airborne sound insulation. The following factors apply:

- Minimise the size of any gaps between door frames and the walls in which they are fixed. No gaps should exceed 10mm.
- Fill and seal gaps between door frames and the surrounding walls in a manner compliant with the fire, security and acoustic performance sought.
- Consider the potential for the acoustic seals to wear the floor covering lying under the opening arc of the door leaf or the floor covering to cause wear to the seals.
- Regularly inspect seals on doorsets and replace when worn, damaged or removed, for example, as a result of vandalism. Avoid locating doorsets in partitions between rooms requiring values above 35 dB, for example, between music rooms, studios, halls for music or drama performance and other teaching spaces. If such routes are unavoidable, consider incorporating acoustic lobbies.

Fire safety

The main objective of fire compartments in schools is to reduce the potential for fire and smoke to develop and spread from the room of origin, while the main objective of fire doorsets is to allow the movement of people and equipment between adjacent fire compartments while preventing the passage of fire and smoke.

A fire strategy should therefore be developed by a qualified fire engineer at an early stage to determine the location of fire doorsets and the minimum fire and smoke resistance they must provide.

The minimum performance each doorset is required to provide depends on where that doorset is located and the fire strategy for that school. The minimum performance identified in Approved Document B is primarily designed to ensure occupants have sufficient time to escape. Additional fire resistance may be required to protect rooms containing items of significant value to the school. However, fewer doorsets and/or doorsets of lower resistance may be acceptable if sprinkler systems are designed and installed in accordance with LPS1048-1: Issue 4 or BS EN 12845: 2004. Further guidance is provided in BB 100 Design for fire safety in schools.

The following factors apply:

- At minimum, fire doorsets should meet the classification specified in Section 3, based on tests conducted to the following standards:
  - BS 476-22: 1987 – Fire tests on building materials and structures. Methods for determination of the fire resistance of non-load bearing elements of construction;
  - BS EN 1634-1: 2000 – Fire resistance tests for door and shutter assemblies. Fire doorsets and shutters; and

– BS EN 1634-3: 2004 – Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware. Smoke control test for door and shutter assemblies.

- It is important to ensure that the interface between the doorsets and surrounding substrate does not reduce the fire performance. Therefore, refer to manufacturers' literature for recommended installation details and ensure they are covered by valid fire performance assessments and third party certification from a recognised third party certification body such as BM Trada, Bodycote Warrington Fire or LPCB.
- Any glazing, hardware or other items specified on the doorset may undermine that doorset's fire resistance. Therefore, ensure they are covered by any supporting evidence of third party certification for those doorsets.
- It is vital that the fire resistance is maintained throughout the life of the school. Therefore ensure:
  – fire doorsets are regularly inspected and maintained in accordance with the manufacturer's instructions by qualified service and maintenance engineers; and
  – the fire strategy plans are consulted before replacing or altering fire resisting doorsets.

Hygrothermal performance

General

Hygrothermal conditions can affect the performance of doorsets, so it is important to ensure the doorsets used withstand these conditions without loss of performance or appearance.

Ability to resist changes/extremes of temperature and humidity

Most areas within the school will have relative humidity levels ranging between 25 per cent and 65 per cent and temperatures ranging between 10°c and 25°c. Doorsets between these areas need not offer significant performance against hygrothermal effects. However, doorsets from these areas into those of higher temperature and humidity will need to provide appropriate resistance to hygrothermal effects. Areas of higher temperature and humidity include changing rooms and kitchens, with temperatures ranging between 10°c and 30°c and relative humidity levels ranging between 25 per cent and 100 per cent.

Capability of resisting the presence of water and water vapour

The surface finishes of doorsets and their associated hardware used in kitchens, changing facilities, toilets and other areas likely to be subject to intermittent contact with water and water vapour should meet the requirements of BS EN 1294: 2000 and BS EN 12219: 2000.

Thermal transmittance

Where there is a temperature difference between two spaces on either side of the doorset; for example, the doorset divides a heated and unheated space; the doorset should be capable of achieving an improved 'U' value of 3.0 W/mk.

In order to prevent heat loss caused by thermal bridging, minimise any gaps between the frame of the doorset and the surrounding wall, and ensure all gaps are filled using appropriate sealants.

Security

The opportunities for crime in schools are increasing. This is primarily because of the increased value and desirability of ICT and other equipment used within schools attracting burglars; and increased access to the school being provided to the wider community both in and out of normal teaching hours.

Arson is also an extremely big problem. According to the Arson Prevention Bureau, 20 schools a week suffer an arson attack in the UK, with arson reportedly costing schools an estimated £83 million in 2004[4].

While arson generally occurs as a result of fire setting on the outside of the school, a large number of fires are set within school buildings – some of which are by burglars attempting to destroy forensic evidence following theft of property from a school.

Doorsets must therefore offer appropriate levels of security performance to prevent unauthorised access by arsonists and burglars, while not preventing the passage of authorised people.

The security each doorset needs to provide depends on a number of factors, including:

- local crime patterns;
- the value and desirability of the equipment contained within the area(s) to which the doorset restricts access;
- the security of the school perimeter and external façade of the school buildings; and
- the use of other crime prevention measures within the school.

Further guidance on school security is available from the local Police Architectural Liaison Officer (ALO) or Crime Prevention Design Advisor (CPDA).

Sustainability

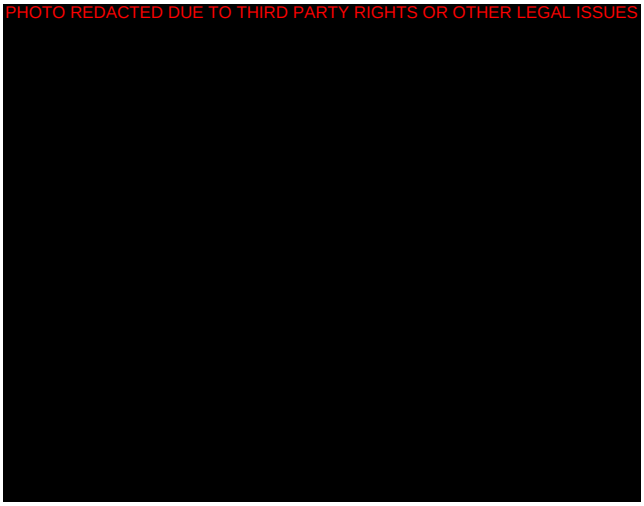
Since March 2005, it has been a Departmental requirement that all major new build and refurbishment projects aim to achieve a minimum BREEAM rating of 'very good'. Compliance with the standard is inspected by a team of licensed assessors.

BREEAM Schools considers a wide range of environmental factors that are affected by the design and construction of school buildings over their operating life. The standard is intended to guarantee a minimum level of environmental performance for school building designs, without specifying particular solutions. Designs score points for meeting various sustainability criteria.

BREEAM Schools assesses the performance of buildings in a number of areas. The selection of doorsets can affect the scores achieved under the following credits within BREEAM for Schools:

- MW8 – Responsible sourcing of materials.
- MW10 – Designing for robustness.

Further information on BREEAM and a copy of the BREEAM for Schools Technical Manual are available at www.breeam.org



4 Zurich Municipal, July 2005

Specifying doorsets complying with the requirements of this doorset specification document can reduce the environmental impact of the doorsets. This is because:

- The outer frame of 'cassette' style doorsets can act as a template to be used to aid construction of the opening when the wall is formed. This should increase the certainty that the doorsets will fit first time without the need to rework or replace the doorsets to suit the hole into which the doorset is to be installed, thus reducing construction waste.
- Doorsets can be installed later in the build programme, reducing opportunities for them to be damaged during fit-out and subsequently scrapped.
- Manufacturers can invest in developing their production systems to suit the standard sizes of doorsets required, providing more opportunities for reducing production waste and inefficiencies.
- The cassette design allows doorsets to be interchanged with one another when the use of spaces within the school changes.

Durability

Doorsets are required to perform satisfactorily under the conditions appropriate to the specified categories of use, given reasonable use and the expected standards of maintenance, for a period of 20 years.

The following formula can be used to determine the total number of times the doorset is expected to be used over its lifetime and can be used to specify the appropriate durability classification according to EN 1191: 2000, as illustrated in Table 3.

Figure 5 The approximate number of times a doorset will be operated during its lifetime

X = Y x ((T x N) + (t x n))

Where

X = Approximate number of times the doorset will be operated in its lifetime

Y = Expected lifetime of the doorset

T = Average number of expected operations on each teaching day

N = Number of teaching days each year

t = Average number of expected uses on each non-teaching day

n = Number of non-teaching days on which doorset is likely to be used each year

Table 3 Durability classifications according to total number of operations expected over the intended lifetime

Durability Class defined in EN 1191: 2000	1	2	3	4	5	6	7	8
Approximate number of operations over lifetime of doorset (000's)	5	10	20	50	100	200	500	1000

It is important to reduce the likelihood of careless operation causing damage to the door, hardware or adjacent walls in order to achieve the lifetimes specified. Therefore ensure the doorsets:

- meet the minimum mechanical strength classifications specified in Section 3 and are located a sufficient distance from adjacent walls to prevent the door or its associated hardware impacting the wall when opened; or
- incorporate door stops fitted as close to the leading edge of the leaf and no less than two thirds of the door width away from the hinge line. It is also important to ensure door stops are never located in positions where they may constitute a trip hazard.

Avoiding the use of door closers on any doorsets that are not required to be self closing will help extend the life of those doorsets and associated hardware such as hinges and latches. This will also help to reduce the force required to open the door, making it more useable by disabled and other users who may otherwise struggle to overcome the additional resistance to opening caused by the use of closers.

If door closers are fitted on fire doorsets on circulation routes, ensure they incorporate electromagnetic hold-open devices linked to the automatic fire detection and alarm system, to help reduce the number of times the doorset is operated each day while also ensuring the doorsets can close when required to act as a fire or smoke barrier. However, electromagnetic hold-open devices should not be fitted to doorsets required to be self closing in order to provide appropriate privacy, such as doorsets to changing rooms.

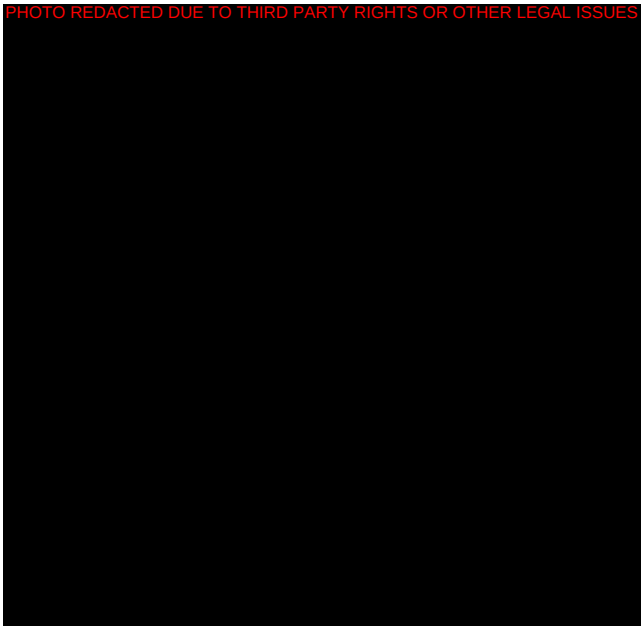
Structural performance

A doorset and its associated hardware should be capable of withstanding incidental static, dynamic and impact forces. The minimum doorset strengths identified within Section 3 reflect the level of care likely to be taken by those either using the doorset or moving near the doorset. They are given in terms of classifications to BS EN 1192: 2000[5].

Doorsets fitted to moveable partitions

School environments are generally required to perform a multitude of activities over time. This results in some spaces being required to be adaptable. There are numerous proprietary moveable wall products available on the market to achieve this, and many incorporate doorsets.

Although such doorsets are outside the scope of this publication, they should comply with the performance requirements identified within this publication appropriate to the function of the spaces divided by the partitions.



5 BS EN 1192: 2000 Doors. Classification of strength requirements, BSI.

Health and safety

Always ensure:

- work involving installation and maintenance of doorsets is covered by a valid risk assessment and method statements;
- doorsets and their associated hardware incorporate adequate means to prevent casual dismantling or tampering; and
- all power-operated doorsets meet the requirements of BS 7036: Part 1: 1996.

The risk of fingers becoming trapped in doors should be considered, in particular, on doors that will not be held open using hold-open devices during peak periods of pedestrian movement through those door doorways. Although the risks of finger trapping are more prevalent in nursery, primary and special schools, the risks should be considered when designing secondary schools especially in relation to doors to spaces within the school where young children may occasionally be present, such as, reception areas and halls.

Specify the fitting of finger guards where considered appropriate to the risk, ensuring the guards do not:

- reduce the width of the clear opening below that required to satisfy DDA requirements; or
- undermine the doorset's ability to provide the performance defined in Section 3.

Provision for engineering services

Avoid incorporating ventilation grilles in internal doorsets wherever possible. If their use is unavoidable, ensure the ventilation grilles do not compromise the doorset's compliance with the performance requirements specified in Section 3.

Certification and approval

Many issues can affect whether the doorsets supplied and installed offer the performance required within this standard. It is therefore important to ensure:

- Any test evidence supplied to confirm the doorset offers the required performance covers:
  - the construction of the doorset and hardware fitted;
  - the opening configuration;
  - size; and
  - installation method.
- The tests were independently conducted, preferably by a suitably qualified laboratory accredited to BS EN ISO/IEC 17025: 2005 by a recognised accreditation body such as UKAS.
- The doorset's conformity with the full set of requirements contained within this document is confirmed by a third party certification body which:
  - is independent of manufacturer interest;
  - regularly audits the production to ensure the units produced continue to meet the required performance classifications; and
  - is independently accredited to BS EN 45011:1998 by a recognised accreditation body such as UKAS.

Doorsets must be installed in accordance with the approved instructions into openings within the tolerances permitted by this standard. In order to ensure the quality of installation work undertaken and performance of the doorsets once installed, ensure those installing the doorsets are approved under recognised third party installer schemes such as those operated for fire doorsets by BM Trada, FIRAS and LPCB.

Installation and commissioning

Installation

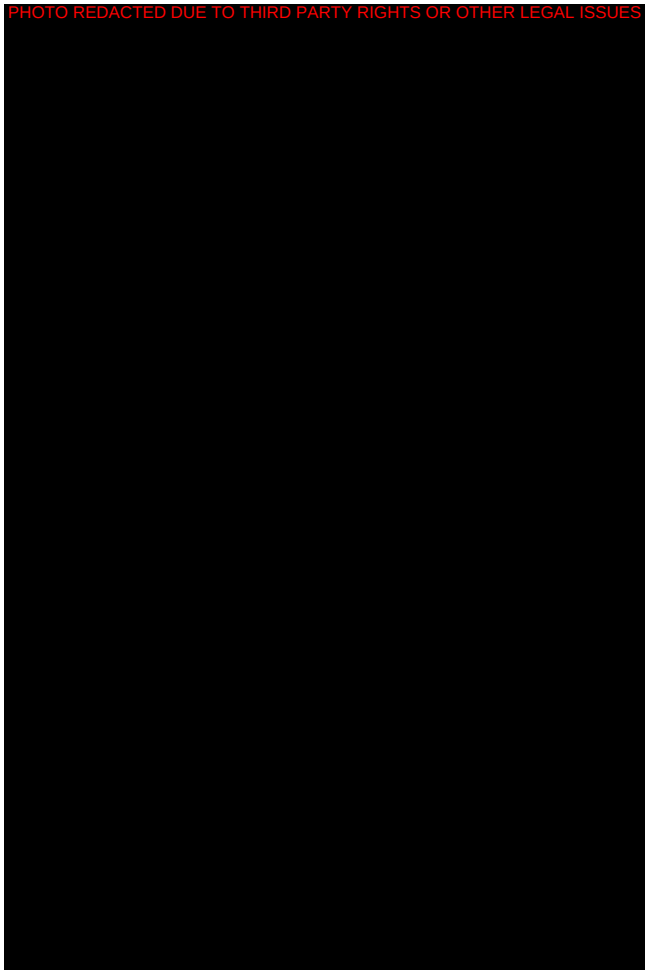
Doors are often installed before much of the fit out of the building is complete. This increases the opportunity for damage to the doors to occur before the building is handed over to the client and can result in doors requiring repair or replacement towards the end of the project.

In addition, if doors are supplied to site as kits of parts rather than complete assemblies (sets), the various components can become mixed up on site if they are not marked up well, or are all unpacked at once rather than unpacked as and when each component is required. This can result in the wrong components being paired together and reworked in order to assemble and fit doorsets on site.

These issues can affect installation timescales and installation and waste costs, as well as the performance of the door once it is assembled and installed.

The following factors apply:

- Doors should be delivered to site in as completely assembled a state as possible, prepared ready to take any projecting hardware supplied separately to prevent damage to the hardware in transit.
- Any hardware supplied separately should be suitably packed to prevent damage and marked to show which doors they are to be fitted to. These should then be paired with the relevant doors on site.
- Doors supplied to site as pre-assembled sets have the advantage that they can be installed into pre-constructed openings within the building fabric much later in the build programme than traditional door assemblies supplied to site as separate frames, leaves, hardware and architraves.
- Where the opening into which the door is to be fitted is formed by timber stud, the doorsets can be installed directly into openings pre-formed within the stud work. Alternatively, in the case of brick, blockwork or concrete walls, cassette style doorsets can be used to speed up installation. That is, an outer frame can be built into the fabric of the wall allowing the doorset to be slotted into position on delivery and fixed back to the outer frame and/or surrounding wall.
- In all cases, with each door the manufacturers should supply instructions for the door's secure installation and use and should describe how the doors are to be fitted and used in order to achieve the requirements of this document.



Commissioning

Once the doorset is installed, the following factors apply:

- Check:
  - all seals and intumescents are present;
  - fixings are present and secure; and
  - hardware is installed and operates correctly.
- Check the force required to open the doorset to ensure the opening force is no greater than the following when measured at the leading edge of the door:
  - 30 N from 0° (the door in the closed position) to 30° open; and
  - 22.5 N from 30° to 60°.

  If it is not possible to measure the forces at the leading edge, the forces may be measured at a point on the face of the door up to 60mm from the leading edge, a position approximately in line vertically with the spindle of a lever handle or the centre line of a pull handle or push plate, in which case the opening force limits can be increased by approximately 2 N.

  The accuracy of force measuring instruments available on the market varies and there are inherent difficulties in measuring forces on site. It is therefore recognised that any measurements are subject to a degree of imprecision which could give rise to variations of between 2 and 3 N.
- Adjust any closers fitted to the doorset to ensure that they can close the leaf from any position and the operating forces fall within the limits described above.
- Check any hold-open devices to ensure that they hold the door leaf open and release when signalled to do so by the fire detection and alarm system.

Maintenance

The maintenance instructions manufacturers issue with each doorset should cover:

- cleaning;
- decorating;
- lubricating moving parts;
- checking operating forces and functionality;
- checking seals;
- replacing damaged components; and
- maintenance of any hardware supplied on/with the doorset.

The maintenance described within the instructions should match that applied to samples during durability tests conducted during the evaluation of the doorset's performance to the requirements defined in Section 3.

The project architect should use this information to compile an operation and maintenance manual for the doorsets specified. This should be handed to the maintenance staff on completion of the contract.

The manual should include all maintenance recommendations made by the doorset manufacturer because the performance claimed by the manufacturer is likely to be conditional on such measures being implemented.

The maintenance regime should ensure doorsets and their associated hardware are visually inspected on a regular basis to make sure they are free of defects and that all seals and fixings are in place and secure. This is particularly relevant to fire doorsets as removal of, or damage to, intumescent strips may undermine the doorsets' performance in a fire situation.

It is also important to ensure that the doorset continues to operate using forces below those defined within Approved Document M. As with the initial commissioning checks, this maintenance can be conducted using a plunger-type force measuring instrument.

Any increases in the force measured during maintenance checks beyond that measured during commissioning or previous maintenance checks may indicate problems that could be affecting the doorset's compliance with other performance requirements, such as fire resistance, acoustic performance, security and durability. It is therefore important to investigate the likely causes of any increase in the operating force and repair or replace the doorset/hardware as appropriate.

In order to ensure the continued performance of doorsets to the relevant standards, it is critical that the replacement components match those being replaced. If alternative components are sourced, for example, different locksets, it is important to ensure that the use of that alternative lockset is covered by appropriate third party assessments and does not invalidate any warranty or certification covering that doorset.

Cost comment

Capital costs

The unit capital costs of doorsets are affected by many factors:

- designing and developing the doors and hardware;
- tooling and pre-production costs;
- testing and approval costs;
- materials and proof of sourcing (environmental policy/legislation);
- production and delivery costs; and
- administration, overheads and profit of manufacturing company.

The first three can be classified as fixed costs that need to be covered by the doors sold to that specification. Therefore, the impact these have on the unit cost of the doorsets manufactured to that specification reduces significantly as the number of doorsets specified increases. This is also true to some extent for the last three items.

Standardising the doorsets' design and performance characteristics can lead to savings through economies of scale that largely offset the additional cost of developing and producing doorsets which achieve the specified performance criteria.

Research suggests that specifying doorsets in accordance with the recommendations of this document may result in a small increase, of around one per cent, in the initial capital cost of doorsets. This is because the product is likely to be of a generally higher and more consistent quality than is being delivered in current projects.

Whole-life costs

The higher capital cost should be more than offset by opportunities for reductions in other whole-life costs arising from compliance with this doorset specification. These include:

- Specification and tendering

  The new specification provides a single point of reference on performance requirements that should help to reduce time taken to draw up door schedules and tender requirements.

- Installation and commissioning

  Supplying doorsets to site as complete sets should:

  – reduce installation times and associated costs;

  – enable doorsets to be fitted much later in the build programme, reducing opportunities for doors to suffer damage during building work; and

  – help to reduce snagging costs.

- Operating costs

  The standards relating to durability, impact resistance, surface finish and security should help to minimise damage suffered by doors during normal use, thereby reducing repair and maintaining costs.

  Further reductions can be achieved by selecting doors that:

  – achieve higher durability classifications with fewer maintenance conditions identified within the relevant maintenance instructions; and

  – do not incorporate unique designs, materials or components that may not easily be replaced/repaired over the desired design life of the doorset.

- Consequential cost of product failure

  If a doorset suffers a catastrophic failure in service, this will not only lead to replacement costs but may also incur consequential costs that are often a hidden cost of specifying lower performance doors. Such costs may include:

  – loss of availability of an area for its normal use;

  – claims resulting from injury or death, for example, due to a doorset failing to offer required resistance to fire and smoke; and

  – damage to or losses of other items in the environment, for example, the value of products stolen if a door fails to offer the required resistance to forced entry.

  By defining minimum levels of security, the doorsets should help achieve a significant reduction in the level of theft of ICT and other equipment, and may help reduce losses from arson. This could result in significant consequential benefits to school users since crime and arson can lead to:

  – lost learning time;

  – loss of facilities for extramural community activities; and

  – cost of treating staff and pupils for psychological affects of being a victim of crime or fire.

3

Performance specifications and design solutions

This section provides performance specifications and some design examples for doorsets, together with their associated hardware. The section also defines the locations where each door type may be used.

Doorsets may be referenced in specifications using the codes contained within this section, in the following examples, rather than including all the information contained within this document.

The first part of the specification code used should relate to the type of doorset that is appropriate to the spaces each side of the opening in which the doorset is to be fitted. This can be determined using Table 4.

The next should be a numeric code placed in brackets indicating the number of leaves on the doorset:

(1) = single leaf doorset

(1.5) = leaf and half doorset

(2) = double leaf doorset

The final part of the code should be a number relating to the hardware set that is to be fitted to the door. These should be selected according to the door type and are described in Tables 7-14.

Figure 6 Example door reference for a single leaf door between a circulation space and a food technology teaching space

B2h(1)4

Where

B2h = Doorset leading into heavy-practical teaching and other work spaces of higher humidity than the adjacent spaces from which the door leads, as indicated as being appropriate for that location in Table 5.

(1) = Single leaf

4 = Doorset is to be fitted with hardware set '4'. This was selected from the hardware options noted as being appropriate for a 'B2h' doorset because the doorset is to be used in a situation where a self closing doorset is required to satisfy the requirements of Approved Document B.

Doorsets specifications

This section defines the design and performance attributes of internal doorsets.

Detailed performance and design specifications for individual types of doorsets are defined in Table 4.

The doorset specifications are grouped according to the minimum acoustic performance each doorset is expected to provide and the areas in which those doorsets may be used.

Notes relating to the performance requirements common to all doorsets are provided in Table 4.

Table 5 indicates the reference code of the type of doorset that should be specified according to the two spaces that doorset separates. The codes contained within the right hand column(s) refer to the detailed doorset specifications defined in Table 4.

Mechanical durability

The classifications defined within the individual doorset specifications assume those doorsets that incorporate door closers will also incorporate electromagnetic hold-open devices and that the hold-open devices will be operated during periods of peak movement of people to reduce the number of times the doorset is operated. If this is not the case, then the higher durability classifications should be specified according to the expected frequency of use and lifetime of that doorset, as discussed in the durability section on page 19.

Mechanical strength

This includes resistance to accidental impact.

Grade	Description
1	Light duty – Low frequency of use with care – e.g. private house owners where there is a small chance of accident occurring or misuse
2	Medium duty – Medium frequency of use primarily with care, with some chance of accident/misuse

3 Heavy duty – High frequency of use without care with good chance of accident/misuse

4 Frequent violent use

Fire and smoke resistance

All fire doors should, at minimum, offer the fire performance specified when subjected to exposure from each side of the doorset separately.

Two classifications are noted for each doorset:

- Those starting 'FD' relate to tests conducted in accordance with the following British Standard:
  - BS 476 Part 22 Methods for determination of the fire resistance of non-load bearing elements of construction.
- Those starting with 'E' relate to tests conducted in accordance with one of the following European Standards for doorsets:
  - BS EN 1634-1: 2000 Fire resistance tests for door and shutter assemblies. Fire doors and shutters.
  - BS EN 1634-3: 2001 Fire resistance tests for door and shutter assemblies. Smoke control doors.

In both cases, the number following the initial letter(s) relates to the minimum period of integrity provided by the doorset. The additional letter 'S' or 'Sa' placed at the end of the classification relates to the need for the doorset to restrict smoke leakage at ambient temperature.

Doorsets that achieve higher fire and smoke classifications than those noted may be required if they are to be used in areas of higher fire risk or to provide greater protection to emergency escape routes to allow all occupants to exit the building safely via that route. BB 100 provides further guidance.

Security

Higher security ratings may be appropriate depending to the location of the school, the value of equipment located within the protected space and the ease with which criminals could access that doorset at different times of the day and night. It is therefore recommended that the advice of the local architectural liaison officer is sought when determining whether greater security performance is required.

Hygrothermal performance

This covers the doorsets' behaviour when set between spaces that have different climates, as experienced by doorsets to kitchens, changing rooms and food technology teaching spaces.

Doorsets requiring hygrothermal performance must comply with BS EN 12219: 2000 and BS EN 1294: 2000 and are indicated by 'h' after the reference code for the core door type. For example, 'Eh' is the version of door 'E' that provides hygrothermal performance.

Vision panels

If the specification indicates the door must incorporate vision panels, then vision panels should be fitted to each full leaf as illustrated in Figure 3 or 4.

The maximum width of each vision panel should be 90mm and the vision panels should incorporate glass meeting class C to BS 6206: 1981.

Table 4 Doorset specifications

Doorset	Code	A	B1	B2	C1	C2	D	E	F	G
	Description	Doorsets leading into music and performance spaces	Doorsets leading into general teaching spaces, light-practical paces, offices, etc.	Doorsets leading into heavy-practical teaching and other work spaces of similar humidity to the adjacent spaces from which the door leads	Toilets and changing rooms for disabled pupils, staff and visitors	Toilets and changing rooms for non-disabled pupils, staff and visitors	General purpose doorsets with vision panels for use on circulation routes with ability to secure unused areas of the school outside normal teaching hours	Doorsets into cupboards containing equipment or materials for lightweight activities (e.g. stationery and text books)	Doorsets into materials storage and preparation areas for heavy-practical activities.	Doorsets into chemical and other hazardous material stores, service ducts and plant rooms
Minimum performance requirements	**Acoustics** (Rw (dB) to BS EN ISO717-1: 1997)	35	30	30	30	30	0	0	0	0
	Mechanical durability (Class defined in BS EN 12400: 2000	5	5	5	5	8	2	3	3	3
	Mechanical strength (BS EN 1192: 2000)	3	3	4	3	3	3	3	4	4
	Fire and smoke resistance (value of "##" in FD##s to BS 476-22 or E##Sa to BS EN 1634-3: 2001)	30	30	30	30	30	30	30	60	60
	Security (Security rating defined in LPS 1175)	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Hygrothermal performance (Class defined in BS EN 1192: 2000 and BS EN 1294: 2000)	x	x	✓/x	✓	✓	x	✓/x	✓/x	✓/x
Design requirements	**Vision panels**	✓	✓	✓	x	x	✓	x	✓	x
	Hardware sets	4 or 5	4 or 5	4 or 5	6	7	1	2	4 or 5	3

Table 4 continued

Cassette design	All doorsets to be fitted into masonry openings should incorporate an outer sub-frame capable of being used as a template to construct the opening and into which the doorset can be fitted at the time of installation.
Doorset height	2100mm (from finished floor level)
Frame depth	Should suit wall types into which they are to be fitted and should accommodate variances in wall thickness of ± 5mm.
Hygiene	• Should not contain materials that could be detrimental to the health and safety of the user. • Exposed surfaces should be capable of withstanding routine wet cleaning by mild detergents or disinfectants, without deterioration or discoloration of surfaces.
Leaf height	2040mm
Leaf width	926mm
Lippings (timber leaves)	Curved post formed edges
Surface finish	• Minimum of class 3 when tested to methods 2 to 6 in BS 3962-6: 1980. • Should be capable of withstanding cleaning with hot water containing mild non-abrasive detergents and disinfects as part of regular cleaning programmes.
Thresholds	None to be fitted.
Variance in structural opening (height and width)	Doorsets should accommodate variances in the height and width of structural openings of + 10/-0mm.

Table 5 Doorset types

		Teaching spaces						
	Circulation spaces	General teaching spaces	Science laboratories	Art, textiles, graphics, electronics and control	ICT suites and cluster rooms	Resistant materials and engineering	Food technology	Music classrooms, music recital, music practice, ensemble rooms, recording studios, studio control rooms, drama studios and audiovisual studios/ conference facilities
Horizontal and vertical circulation spaces including atria	D	B1	B1	B1	B1	B2	B2h	A
Teaching spaces	B1[6]							
Meeting rooms (including interview rooms)	B1							
Offices for head teacher, senior teaching staff and caretaker	B1							
Staff rooms	B1							
Reprographic facilities	B1							
Medical inspection rooms and sick bays	B1							
Storage	E[7]	E	E[8]	E	E	E[9]	Eh[10]	E
Science preparation rooms	B1		B1					
Dining and sandwich/vending areas	D							
Common rooms	D							
Kitchen preparation areas	B2h							
Kitchen staff rooms	B1							
Kitchen walk-in store rooms	F							
Toilets and changing rooms	C1[11]							
Plant rooms and service ducts	G	G	G	G	G	G	Gh	
Server rooms	E				E			

6 Type A for performance spaces; B2 for resistant materials and engineering; B2h for food technology.

7 Type Fh to food technology storage; Type G for chemical storage.

8 Type G for chemical store.

9 Type B2 for heavy material storage.

10 Type B2h to food technology food storage.

11 Type C2 for disabled users.

Table 5 Doorset types continued

	Halls		Learning resource areas			Services		
	Main assembly/ multi-purpose halls	Lecture theatres (over 50 people)	SEN resource bases/small group rooms/study areas/meeting rooms/ offices/MI rooms	Libraries and careers centres	Study areas	Toilets and changing rooms	Plant rooms and service ducts	Server rooms
Horizontal and vertical circulation spaces including atria	B1	B1	B1	B1	B1	C1[11]	G	E
Teaching spaces				B1	B1		G[12]	E
Meeting rooms (including interview rooms)			B1				G	
Offices for head teacher, senior teaching staff and caretaker			B1					
Staff rooms			B1				G	
Reprographic facilities			B1				G	E
Medical inspection rooms and sick bays			B1					
Storage	E	E	E	E	E	Eh	G	
Science preparation rooms							G	
Dining and sandwich/vending areas	D[13]					C1[11]	G	
Common rooms							G	
Kitchen preparation areas	B2h						Gh	
Kitchen staff rooms	B1						G	
Kitchen walk-in store rooms								
Toilets and changing rooms	C1[11]					C1[11]		
Plant rooms and service ducts	G	G	G	G	G		G	E
Server rooms	E			E				

12 Type Gh to food technology.

13 Specify type 'B1' doorset if either of the two adjacent spaces may be used for teaching or other study activities and 'A' if those activities are related to music or drama.

Table 5 Doorset types continued

	Staff and administration				Dining and social areas		Catering services		
	Meeting rooms (including interview rooms)	Offices for head teacher, senior teaching staff and caretaker	Reprographic facilities	Medical inspection rooms and sick bays	Dining and sandwich/ vending areas	Common rooms	Kitchen preparation areas	Kitchen staff rooms	Kitchen walk-in store rooms
Horizontal and vertical circulation spaces including atria	B1	B1	B1	B1	D[13]	D[13]	B2h	B1	F
Teaching spaces					D[13]				
Meeting rooms (including interview rooms									
Offices for head teacher, senior teaching staff and caretaker									
Staff rooms									
Reprographic facilities		B1					G	E	E
Storage	E		E		E	E	Eh		
Dining and sandwich/vending areas						D[13]	B2h	B1	
Common rooms					D[13]				
Kitchen preparation areas					B2h			B2h	Fh
Kitchen staff rooms					B1		B2h		
Kitchen walk-in store rooms							Fh		
Toilets and changing rooms					C1[11]	E			
Plant rooms and service ducts	G		G		G	G	Gh	G	
Server rooms			E						

Table 5 Doorset types continued

	Storage									
	General teaching storage	Musical instrument storage	Science preparation rooms	Chemical stores	Light-practical storage/ preparation rooms	Heavy-practical storage	Food technology food storage	Exam paper storage	Chair store	Maintenance and cleaners' stores
Horizontal and vertical circulation spaces including atria	E	E	B1	G	B1	F	Fh	E	E	E
Teaching spaces	E[14]	E	B1	G	B1	B2	B2h	E	E[14]	E[14]
Meeting rooms (including interview rooms)	E							E	E	E
Offices for head teacher, senior teaching staff and caretaker										
Staff rooms	E							E		
Reprographic facilities	E							E		
Storage			E[8]		E	E[15]				E[8]
Dining and sandwich/vending areas	E		B1	G				E		E
Common rooms									E	E
Kitchen preparation areas										Eh
Kitchen staff rooms										
Kitchen walk-in store rooms										
Toilets and changing rooms										E
Plant rooms and service ducts			G	G	G	G				
Server rooms										

14 Type Eh to food technology.

15 Type F for heavy practical storage/preparation areas.

Hardware specifications

This section defines the hardware sets referred to in the doorset specifications defined in Table 5.

Tables 7-14 define the classifications the hardware selected must meet in accordance with the products standards referred to for each type of hardware. A key to the classification symbols used in that table is provided in Table 5. The classification symbols are based on those developed by the Association of Building Hardware Manufacturers (ABHM)[16].

Requirements and notes common to all hardware sets are outlined in the sections below.

Closers

Avoid selecting hardware options that include closers wherever possible, as closers can affect the ability of disabled users to operate the doorsets to which they are fitted.

Where closers are specified, they should meet the requirements of BS EN 1154.

The closers specified in Tables 7-14 incorporate adjustable closing force (power) settings. Where possible, specify those closers with 'wind-up' spring adjusters as these are easier to adjust than those whose power is set using a template or via adjustable shoes. Always ensure the power is set according to that needed to return the door to the closed condition so that optimum fire resistance and acoustic performance are achieved when the room is in use and the operating forces are within the limit permitted within BS 8300.

Delayed action closers may be fitted to doorsets to individual rooms but are not recommended for use on doorsets across circulation routes. If a delayed action closer is fitted, it should not delay the closing action more than that required for its use (for example, for the ease of elderly or disabled people). Where the device is fitted to a fire door, this delay should not exceed 25 seconds, as specified in BS EN 1154.

Cylinders

Cylinders should meet the requirements of BS EN 1303.

Specify cylinders that can be operated:

- within a common master key system; and
- by a key on both sides of the doorset.

Select cylinders of profiles that are compatible with the lock on which the cylinder is to be used and ensure the cylinder is of a common profile, such as Scandinavian oval and Europrofile.

Ensure the cylinder's length suits the thickness of the door leaf and any trim specified.

Specify category 4 durability if the cylinder is likely to be used to lock/unlock the doorset up to seven times each day and category 5 durability if the cylinder is likely to be used to lock/unlock the doorset between 8 and 14 times each day.

16 The ABHM now forms part of the Door and Hardware Federation (DHF).

Door protection plates

These are not required on steel doorsets or timber doorsets with a laminate finish.

Specify the following protection plates if the leaves are veneered or painted:

- One 200mm high by 2mm thick kick plate of width to suit door leaf to be fitted to the foot of each face of the leaf.
- Either one 200mm wide by 1400mm high vertical protection plate/push plate to be fitted to the face of the leaf used to push the leaf open; or, if a single plate is not compatible with the other hardware fitted to the door, two 200mm wide vertical protection plates/push plates, fitted to that face of the leaf above and below the lock position.

Door stops

To avoid the door or hardware from being damaged, stops should be fitted to the skirting board on the adjacent wall. Where practicable, the stops should be located so that when they make contact with the door leaf they do so no less than two-thirds across the width of the leaf when measured from the hinge line.

Electro-magnetic hold open devices

Electro-magnetic hold open devices should meet the requirements of BS EN 1155.

Electro-magnetic hold open devices should be linked to the fire detection and alarm system and be compatible with that fire detection and alarm system.

Specify electro-magnetic devices only on self-closing fire doors, and ensure only those devices which release automatically in the event of a fire are used.

When specifying the power rating, consider the closing force applied to the door leaf by any closer fitted to that doorset when that leaf is held open by the electromagnetic hold open device.

If the door is further than 300mm away from a wall or is not parallel with an adjacent wall when held open, then the leading edge of the door leaf should be guarded when in the open position to prevent accidental impact.

Hinges

Hinges should meet the requirements of BS EN 1935.

The test door mass classification specified should suit the mass of the leaves on the doorsets to which they are to be fitted. However, the actual mass of the doorset that the hinges of a particular class may be fitted to is reduced by the following factor if the doorset is fitted with a closer:

- 20 per cent if the closer does not incorporate a backcheck function; or
- 75 per cent if the closer incorporates a backcheck function.

For example, a grade 13 hinge (test door mass grade 6) that is rated for use on test door of mass 120 kg should only be fitted to doors of mass up to 96 kg if a closer is fitted to the doorset and 30 kg if that closer incorporates a backcheck function.

Other features of the doorset and how it will be used that should be considered when specifying the class of hinge to be fitted to a doorset are factors affecting:

- operating force such as whether the doorset is designed to be used by elderly, infirm or disabled people;

- the closing moment provided by the closer over the final 4° of door leaf movement towards the closed position, including whether:
  - the doorset is to be latched or unlatched; and
  - smoke, acoustic and/or other seals are fitted.

For example, hinges with low friction bearings may be appropriate where opening force is to be minimised.

As with all hardware fitted to the doorset, it is important to ensure the type of hinges specified, location where they are fitted, and the manner in which they are fitted to the doorset are covered by the appropriate evidence of conformity of the complete doorset with the relevant performance requirements defined in Table 4.

Lever handles

Lever handles are only required if the doorset incorporates a latch function.

They should meet the requirements of BS EN 1906.

It is important to ensure the lever handles specified are compatible with the locks with which they are to be used.

In order to satisfy BS 8300: 2001, specify lever handles that:

- have a minimum diameter of 19mm;
- are offset from the door leaf by at least 45mm;
- are at least 95mm long;
- have a return end;
- visually contrast with the door leaf by at least 20 LRV points; and
- are 'warm to touch' if located on external faces of external doorsets.

Locks

Locks should meet the requirements of BS EN 12209.

Specify mortice locks with common lock case dimensions and backsets. This ensures maximum commonality between the construction of the doorsets and greatest opportunity for the interchangeability of the hardware once the doorsets are installed.

Ensure the locks are compatible with the cylinders specified and that the use of those cylinders with the lock is covered by the scope of the lock's approval to the performance classification specified.

The 'door mass and closing force' classifications specified in Tables 7-14 assume the door mass is up to 100kg and a closing force of up to 25 N is applied to the leaf. If this does not reflect the door to which the locks are to be fitted, locks of alternative appropriate 'door mass and closing force' classifications should be specified as indicated in EN 12209.

Specify locks with:

- higher categories of security and drill resistance where appropriate for the doorset to achieve the required security rating
- fields of application appropriate to the type of doorset the locks are to be fitted to
- backsets of at least 54mm and ensure the lock selected is one of a range of modular lock cases, as that allows the lock case to be interchanged with others of differing functionality as and when required, for example, when the use of the room into which the doorset leads changes.

Pull handles

Pull handles should meet the requirements of BS 8424.

In order to satisfy BS 8300: 2001, specify pull handles that:

- have a diameter between 19mm and 35mm;
- are offset from the door leaf by at least 45mm;
- are at least 400mm long; and
- visually contrast with the door leaf by at least 20 LRV points.

In order to satisfy BS 8300: 2001, ensure pull handles are located so that their lower end is 1000mm above finished floor level unless it will result in the handle interfering with other furniture. In which case, set the pull 1100mm above finished floor level.

Locate pull handles in line with the backset of the lock case cylinder barrel and trim.

General

All hardware specified for use on doorsets should be covered by the appropriate supporting evidence of that doorset's conformity with the performance requirements defined in the doorset locations section.

Specify hardware that achieves class 4 corrosion resistance in accordance with BS EN 1670 if the school is near the sea, or is in other areas likely to result in the hardware being exposed to higher salt corrosion.

Table 6 Key to symbols used in Tables 7 to 14

Attribute	Symbol
Category of use	
Closing force	
Corrosion resistance	
Durability	
Field of door application	
Hinge grade	
Hold-open force	
Key identification	

Attribute	Symbol
Safety in use	
Security	
Suitability for use on fire and smoke control doorsets	
Test door mass/size/weight	
Type of key	
Type of operation	
Type of spindle	

Table 7 Hardware – Set 1

Closer						
	4	8	3 5	1	1	3
Cylinder						
	1	4	0	1	0	3
	4	1				
Electromagnetic hold open device						
	3	8	3 5	1	1	3
Hinges						
	4	7	6	1	0	3
	1	13				
Locks	**Cylinder operated deadlock**					
	3	M	4	1	0	C
	4	A, B or H	A	0	C	
Pull handles	**One vertical pull handle should be fitted to the 'pull face' of the door**					
	3	2	–	1	1	3
Signage	**Two 'Automatic fire door keep clear' signs, one on each face if the door is designated a fire door**					

Table 8 Hardware – Set 2

Cylinder						
	1	4	0	1	0	A
						
	4	1				
Hinges						
	4	7	6	1	1	3
						
	1	13				
Locks	**Cylinder operated deadlock**					
						
	3	M	4	1	0	C
						
	4	A, B or H	A	0	C	
Pull handles	**One vertical pull handle should be fitted to the 'pull face' of the door**					
						
	3	2	–	1	1	3
Signage	**Two 'Fire door keep shut' signs, one on each face if the door is designated a fire door**					

Table 9 Hardware – Set 3

Closer						
	4	8	3 5	1	1	3
Cylinder						
	1	4	0	1	0	A
						
	4	1				
Hinges						
	4	7	6	1	1	3
						
	1	13				
Locks	**Cylinder operated deadlock**					
						
	3	M	4	1	0	C
						
	4	A, B or H	A	0	C	
Pull handles	**One vertical pull handle should be fitted to the 'pull face' of the door**					
						
	3	2	–	1	1	3
Signage	**Two 'Fire door keep shut' signs, one on each face if the door is designated a fire door**					

Table 10 Hardware – Set 4

Use in situations where self closing doorsets are required to satisfy the requirements defined within Approved Document B.						
Closer						
	4	8	3 5	1	1	3
Cylinder						
	1	5	0	1	0	A
	4	1				
Electromagnetic hold open device						
	3	8	3 5	1	1	3
Hinges						
	4	7	6	1	1	3
	1	13				
Locks	**Cylinder operated deadlock**					
	3	M	4	1	0	C
	4	A, B or H	A	0	C	
Pull handles	**One vertical pull handle should be fitted to the 'pull face' of the door**					
	3	2	–	1	1	3
Signage	**Two 'Automatic fire door keep clear' signs, one on each face if the door is designated a fire door**					

Table 11 Hardware – Set 5

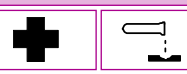
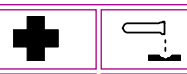
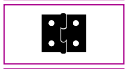
Use in place of 'Hardware Set 4' where the last person using the door can be expected to close the door or where Approved Document B does not require self-closing doorsets.						
Cylinder						
	1	5	0	1	0	A
						
	4	1				
Hinges						
	4	7	6	1	1	3
						
	1	13				
Lever handles						
	4	7	–	1	1	3
						
	2	A				
Locks	**Cylinder operated lock operated by lever handles and cylinder**					
						
	3	M	4	1	0	C
						
	4	A, B or H	A	3	C	
Signage	**Two 'Fire door keep shut' signs, one on each face if the door is designated a fire door**					

Table 12 Hardware – Set 6

Hinges						
	4	7	6	1	1	3
						
	1	13				
Lever handles						
	4	7	–	1	1	3
						
	1	U				
Locks	**Lock with manual deadlocking without need for key operation**					
						
	3	M	4	1	0	C
						
	4	K	G	3	0	
Pull handles	**One vertical pull handle should be fitted to the 'pull face' of the door and one horizontal pull handle should be fitted to the other face of the door**					
						
	3	2	–	1	1	3
Signage	**Two 'Fire door keep shut' signs, one on each face if the door is designated a fire door**					

Table 13 Hardware – Set 7

Closer						
	4	8	3 5	1	1	3
Hinges						
	4	7	6	1	1	3
						
	1	13				
Pull handles	**One vertical pull handle should be fitted to the 'pull face' of the door**					
						
	3	2	–	1	1	3
Signage	**Two 'Automatic fire door keep clear' signs, one on each face if the door is designated a fire door**					

Hardware sets for multi-leaf doorsets

The requirements for hardware sets used on multi-leaf doorsets are generally the same as those used on the single leaf doorsets. The only major differences between the hardware sets used on single and multi-leaf doorsets are:

(i) The number of units of each type of hardware fitted to the complete doorset should suit the number of leaves.

(ii) Multi-leaf doorsets should incorporate lever action flush bolts complying with the minimum requirements defined in Table 14.

Table 14 Minimum requirements for lever action flush bolts fitted to multi-leaf doorsets

BS EN 12051							
	2	1	–	1	1	3	4

4

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This document was published in February 2008. After this date readers should ensure they use the latest edition of all references.

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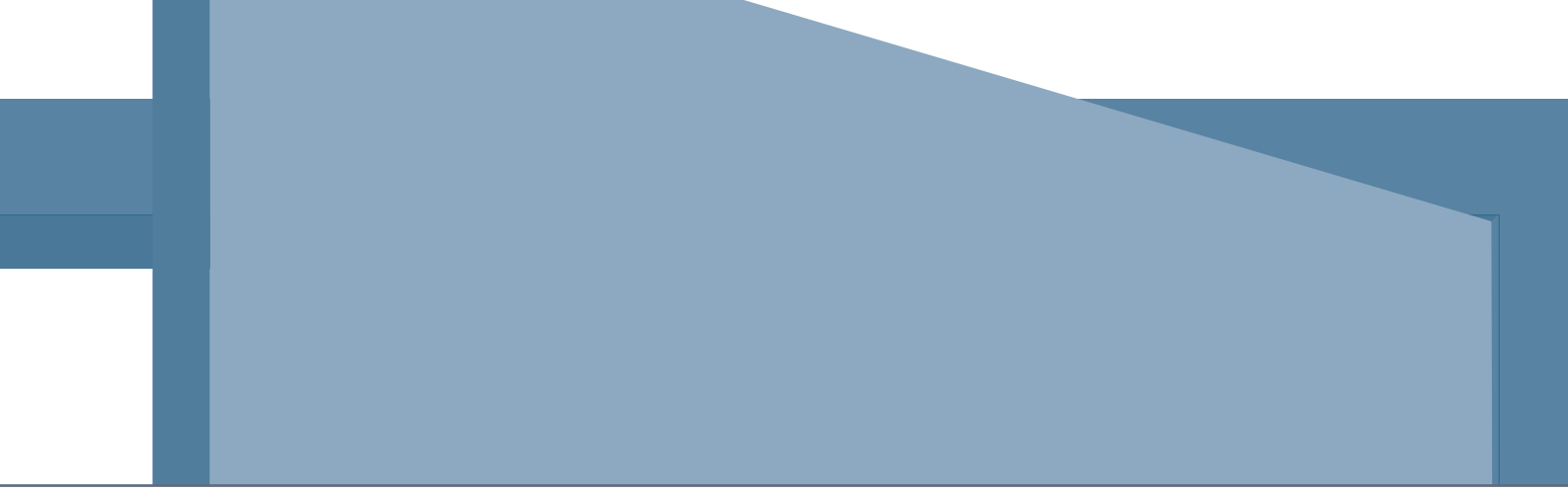

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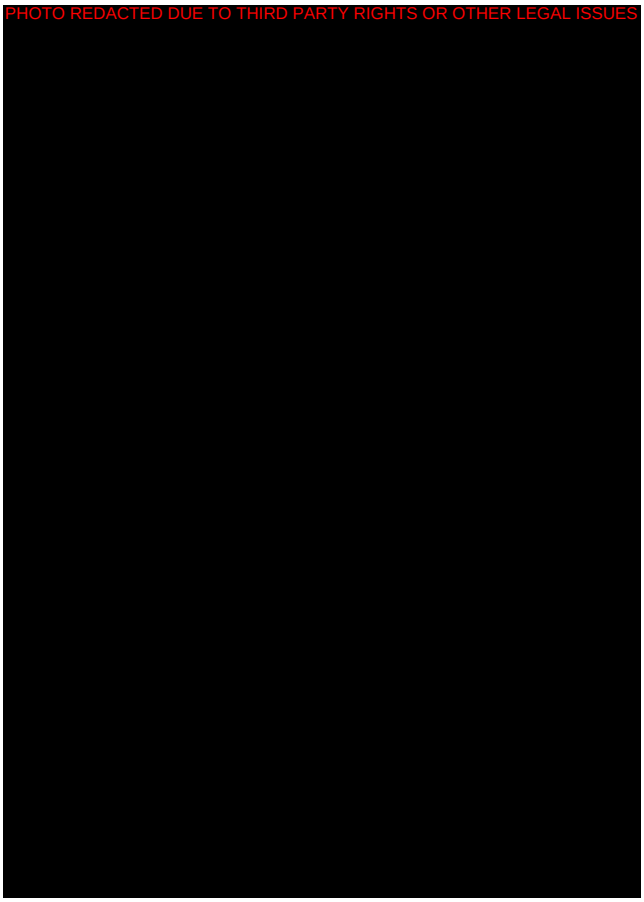

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